

Claims

- [c1] 1.A coated fuel cell bipolar plate comprising:
a metal plate;
an electrically conductive corrosion resistant coating
formed over the metal plate, the coating including a top
surface and porosities; and
an electrically conductive overcoating formed over the
electrically conductive corrosion resistant coating, the
overcoating sealing some or all of the porosities at the
top surface of the electrically conductive corrosion resis-
tant coating.
- [c2] 2.The coated fuel cell bipolar plate of claim 1, wherein
the metal plate includes aluminum.
- [c3] 3.The coated fuel cell bipolar plate of claim 1, wherein
the electrically conductive corrosion resistant coating has
a plurality of layers.
- [c4] 4.The coated fuel cell bipolar plate of claim 1, wherein
the electrically conductive corrosion resistant coating in-
cludes titanium.
- [c5] 5.The coated fuel cell bipolar plate of claim 1, wherein
the electrically conductive corrosion resistant coating in-

cludes titanium nitride.

- [c6] 6.The coated fuel cell bipolar plate of claim 1, wherein the electrically conductive corrosion resistant coating includes titanium aluminum nitride.
- [c7] 7.The coated fuel cell bipolar plate of claim 1, wherein the electrically conductive corrosion resistant coating includes:
 - a sub-layer coated over the outer surface; and
 - a layer coated over the sub-layer;wherein the sub-layer promotes adhesion of the layer to the sub-layer.
- [c8] 8.The coated fuel cell bipolar plate of claim 7, wherein the sub-layer includes titanium.
- [c9] 9.The coated fuel cell bipolar plate of claim 7, wherein the sub-layer includes stainless steel.
- [c10] 10.The coated fuel cell bipolar plate of claim 7, wherein the layer includes titanium aluminum nitride.
- [c11] 11.The coated fuel cell bipolar plate of claim 1, wherein the overcoating is hydrophobic.
- [c12] 12.The coated fuel cell bipolar plate of claim 1, wherein the overcoating includes amorphous graphite.

- [c13] 13.The coated fuel cell bipolar plate of claim 1, wherein the overcoating includes:
a first layer of transition metal coated over the coating;
and
a second layer of amorphous graphite coated over the first layer.
- [c14] 14.The coated fuel cell bipolar plate of claim 13, wherein the transition metal includes chromium, titanium, nickel, iron, or cobalt.
- [c15] 15.A coated fuel cell bipolar plate comprising:
a metal plate;
an electrically conductive corrosion resistant coating formed over the metal plate, the electrically conductive corrosion resistant coating including a top surface and porosities; and
an overcoating formed over the electrically conductive corrosion resistant coating, the overcoating being primarily localized on the porosities at the top surface as an amorphous structure.
- [c16] 16.The coated fuel cell bipolar plate of claim 15, wherein the metal. plate includes aluminum.
- [c17] 17.The coated fuel cell bipolar plate of claim 15, wherein the coating has a plurality of layers.

- [c18] 18.The coated fuel cell bipolar plate of claim 15, wherein the coating includes titanium.
- [c19] 19.The coated fuel cell bipolar plate of claim 15, wherein the coating includes titanium nitride.
- [c20] 20.The coated fuel cell bipolar plate of claim 15, wherein the coating includes titanium aluminum nitride.
- [c21] 21.The coated fuel cell bipolar plate of claim 15, wherein the coating includes:
a sub-layer coated over the outer surface; and
a layer coated over the sub-layer;
wherein the sub-layer promotes adhesion of the layer to the sub-layer.
- [c22] 22.The coated fuel cell bipolar plate of claim 21, wherein the sub-layer includes titanium.
- [c23] 23.The coated fuel cell bipolar plate of claim 21, wherein the sub-layer includes stainless steel.
- [c24] 24.The coated fuel cell bipolar plate of claim 21, wherein the layer includes titanium aluminum nitride.
- [c25] 25.The coated fuel cell bipolar plate of claim 15, wherein the overcoating comprises a 3 discontinuous layer of electrically insulating material.

- [c26] 26. The coated fuel cell bipolar plate of claim 15, wherein the overcoating comprises an oxide.
- [c27] 27. The coated fuel cell bipolar plate of claim 26, wherein the oxide comprises aluminum oxide.
- [c28] 28. The coated fuel cell bipolar plate of claim 15, wherein the overcoating is sufficiently electrically conductive to permit an electrical charge to pass through the overcoating to the coating.
- [c29] 29. The coated fuel cell bipolar plate of claim 15, wherein the overcoating comprises a suboxide.
- [c30] 30. The coated fuel cell bipolar plate of claim 29, wherein the suboxide comprises a suboxide of titanium